B Physics at the Tevatron (BTeV) Project

Progress Report No. 02
September 1-30, 2004
(M. Lindgren - Editor)
(BTeV-3631)

I. PROJECT DESCRIPTION

The BTeV Project provides for the construction and fabrication of the BTeV detector and installing it in the C0 Collision Hall and Counting Room in a state ready to take data and to provide it with a source of high luminosity proton-antiproton collisions in the C0 Interaction Region. The detector, a forward spectrometer, covers the forward rapidity region with respect to the antiproton beam. The detector will permit the experimenters to study the decays of produced particles containing b-quarks and charm quarks to search for Charge Parity (CP) violation, mixing and other rare processes. The ultimate goal is to find physics that is not described by the Standard Model description of these processes and therefore represents new physics beyond the Standard Model. The key areas where BTeV excels are in the ability to study decays of the B_s meson and to study decays of B mesons and baryons that contain photons and π^o's in the final state. Achievement of the necessary sensitivity requires modifications to the accelerator to produce high luminosity at the C0 Interaction Region.

II. OVERVIEW OF PROJECT STATUS – M. Lindgren

The BTeV project continues to make good progress towards baselining and the beginning of construction. The major activity for the month was preparing for the Directors CD-2/3a review of the project, which was held on September 28-30. The review was held at Fermilab, and the conclusion was that the Project was close to having a project baseline. The technical, cost, and schedule of the project were all judged to be ready for baselining. The project was urged to continue to search for candidates to fill the open positions of a project engineer, a QA/procurement officer, and integration physicist. The project was also urged to consider adding a full-time safety officer. It was noted that appropriate management systems are in place or under development. We successfully demonstrated a proof of principle implementation on three subprojects of EVMS machinery using Open Plan and Cobra.

Overall, management continues to forecast the beginning of commissioning with protons as early as December 2009.

There were no injuries on the BTeV project this month.

More detailed information on the project's progress and status this month follows in the rest of this report.

III. MASTER SCHEDULE AND FUNDING SUMMARY

The project continued to work to develop a master WBS Open Plan file. The focus for the month was on rationalizing and eliminating errors from the existing subproject files and then combining them into a master file for use in the review process and for uploading a baseline into the Cobra that could be used to generate cost accounts for the project.

V. NARRATIVE HIGHLIGHTS

MANAGEMENT HIGHLIGHTS – M. Lindgren

Change requests – The project underwent a number of training exercises in change control the previous month, culminating in the generation and approval of a L3 and L4 request. There was a substantial amount of work on the cost and schedule this month in preparation for the review, but no change requests, at the discretion of the Project Manager.

BTeV DETECTORS (WBS 1.0) – M. Lindgren

Overview

There are no statistics for the production status at the end of the month yet, as no items are yet in production. Most groups are continuing R&D efforts, highlighted by efforts at the FNAL Test beam facility, which is reported on below in the subproject narratives.

BTeV Magnets, Toroids, Beampipes (WBS 1.1) – C. Brown

Overview

This subproject, to construct the Vertex Magnet, the Muon Toroids, and the BTeV spectrometer Beam Pipes is currently in the conceptual design stage.

WBS Level 3 Narratives

Pre-construction conceptual design engineering continues on the details of the Vertex Magnet rollers and the Muon Toroid/Compensating Dipole interface. Some conceptual design engineering has been devoted to the Beam Pipe design this month.

Administrative / Project Management

The subproject manger continues to interact with the engineering group on the conceptual design and with the other subprojects through discussions with the Project Manager and also by attendance at the weekly Technical Board meetings.

Milestones for the next six months

This subproject is currently on schedule to finish the conceptual design of the Vertex Magnet, Toroid Magnets and Beam Pipe by April 1, 2005, in accord with the Open Plan WBS1.1 schedule, although there is no explicit milestone associated with this completion. No other work is scheduled in the next six months.

Resources

In September 2004, two mechanical engineers, Ed Chi and Bob Wands, and the subproject manager, Chuck Brown, devoted some of their effort to WBS1.1 conceptual design.

BTeV Pixel Detector(WBS 1.2) – S. Kwan

Overview

The highlight of the month was the irradiation of 4 FPIX2 detectors at IUCF and then the successful test of the first irradiated detectors on the bench. With this, we completed all the goals of the pre-conceptual R&D phase for 2004. This puts us in a strong position to start the preparation for preproduction of the pixel sensors.

On the readout electronics, besides the irradiation tests, we had a number of reviews with the ASIC designers and the CD system test team. A bi-weekly meeting between the two teams of engineers has been established. We laid down the path to the engineering run which is planned for early spring 2005.

We have also made some progress on the mechanical design. We are gearing up to do the 50% vacuum test and the system demonstrator.

We had a Director's CD2/3a review at the end of September. Overall, we did well in the review.

1.2.1 - Sensor and Detector Hybridization

1.2.1.1 Sensor prototypes
Four FPIX2 detectors using the TESLA moderated p-spray sensors were irradiated at IUCF up to about $7x10^{13}$ protons/cm^2. This dose is equivalent to about 1 year of expected fluence for the pixel detector modules that will be placed closest to the beam running at the nominal luminosity of 2x1032. The detectors have been sent back to Fermilab. Initial bench tests showed that the detectors were working properly. The leakage current of the sensors, as expected, went up by about 4 orders of magnitude when running at room temperature.

1.2.1.4 Hybridization prototypes
A systematic study has been performed to check the threshold and noise distribution of all the pixels in the 5-chip module.

1.2.2 – Electronics

1.2.2.1 Pixel Readout Chips
We tested the first irradiated FPIX2 detectors on the bench. The leakage current compensation circuit worked as designed. The required bias settings to the chip were found to be different than for un-irradiated FPIX2 chips but the differences are well understood.

1.2.2.2 HDI & Pixel Module Development
The first 5-chip FPIX2 module was assembled and tested successfully in the lab.

The second module has been partially assembled and tested. Work on the new 1x8
HDI is under way.

1.2.2.9 Feedthrough board

We received two full electrical prototypes of the Feedthrough boards. These will be tested for their electrical properties. The new design FTB is currently being laid out. A preliminary quote was obtained from a number of vendors.

1.2.3 - Mechanical Support, Vacuum, and cooling

1.2.3.2 Substrate
We tested a mock-up y-half-plane with heaters. There was some delamination at a few spots and this problem is currently being investigated. Work has started on the temperature control system.

1.2.3.7 Vacuum system
We have come to an agreement with CKM on getting a vacuum vessel from them to our 50% vacuum test. After much discussion, the plan was to modify their prototype RICH test vessel. We are currently working out a plan to modify the vessel.

1.2.4 - System Integration and Test

1.2.4.5 Test Beam
We have started the analysis of the test beam data. First results were prepared for the Director's Review. A work list has been generated for the next beam test which will start in January 2005.

Administrative and Project Management News

We had a Director's CD2/3a Review on September 28-30. We did well in the review. There were three recommendations. We have continued our discussion with university collaborators on preparing MOU's and SOWs for next year. We are also working with some university collaborators on their funding request for next year.

Personnel

September is a slow month because of vacations and because a lot of the technical staff was drafted to do Tevatron work during the summer shutdown. Overall, this month, about 3 Mechanical engineers, 2 technicians, and 2 Electrical engineers worked on the pixel project. Our physicist manpower remains low.

Milestones

We are on target to have the engineering run of the pixel readout chip next March. However, the ASIC team has to put this as their top priority for the next 6 months in order for this to happen. This was discussed with them at a number of meetings. The other milestone is to have the pre-production run of the sensors starting in January of 2005. We are on target for this milestone.

Ring Imaging Cherenkov (WBS 1.3) – M. Artuso, T. Skwarnicki

Overview

The activities during this month are concentrated on getting ready to complete the MaPMT test beam run in early January. In addition, we are planning the liquid radiator test beam run. Significant progress is made also on a new iteration of the front end ASIC. Moreover we are pursuing tests that will validate the choice of gas and mirror technology.

WBS Level 3 Narratives

1.3.1 MAPMTs

We have also progressed in the optimization of the working point of the MaPMTs and electronics to minimize cross talk and optimize efficiency. We are testing a new biasing scheme optimized for operation at low gain that would improve the matching between MaPMT gain and front end electronics.

1.3.2 PMTs

We made plans for liquid-radiator/PMT test beam next year. We obtained quotations for PMTs from Hamamatsu, Photonis and Burle.

1.3.3 Electronics

1.3.3.1 MAPMT FE Readout Electronics
We were refining VA_MaPMT ASIC design to increase dynamic range. We developed the technical specifications for the next submission that will include prototypes for MaPMT readout ASICs, optimized for higher dynamic range, and PMT readout ASICs, with the same dynamic range as the ASICs used in the test beam, optimized for high input capacitance.

We evaluated consequences of the front end timing/monitoring/control interface proposed by the DAQ group and we are working on the electronics requirement document for the data combiner board interface to the RICH front end.

1.3.3.2 PMT FE Readout Electronics
We made progress in development of the PMT version of the VA_MaPMT ASIC suitable for high input capacitance.

1.3.4 Mirrors

We ordered and received small size mirror prototype from CMA. This mirror is being used for compatibility tests with the gas radiator. In parallel, we are developing a test station to measure the mirror reflectance. We are planning to monitor spot size and reflectance over an extended period of time, to verify the compatibility between the preferred mirror technology and the gas environment.

1.3.5 Mechanical, Gas, Liquid & Related Systems

1.3.5.1 Gas Radiator

The refractive index of C_4F_8O was re-measured using our Michelson-Morley interferometer set-up. The results agree better with the average refractive index determined from the size of the Cherenkov ring observed in the MaPMT test beam data.

Material compatibility tests were started. A number of materials are exposed to C_4F_8O under elevated temperature to accelerate chemical reactions. The gas properties are monitored weekly for changes. Material properties are checked on a bi-weekly basis.

1.3.6 Power, Monitoring, Cooling & Related Systems

1.3.7 Installation, Integration & Testing

We have completed the analysis of the data taken in the first phase of the gas radiator beam test. We are preparing for the completion of the gas radiator beam test. The remaining task is to take data with the full system of 52 MaPMTs operating simultaneously. We have been working on improving DAQ system for the next round of gas-radiator/MAPMT test beam, which will allow readout of all MAPMTs at the same time and triggering on tracks. To that end, we made progress in developing firmware for FE hybrid board and synchronization between many FE hybrid boards.

In addition we are starting the design of the PMT beam test run to take place later next year. We have performed some simulation studies of the system and we have started acquiring the components needed.

1.3.8 Software

1.3.9 Management / Administrative / Project Management

We made improvements to the WBS Dictionary and BoE. The TDR was updated to include MAPMT test beam results.
We developed a first draft of the MOU between Syracuse and FNAL.

Electromagnetic Calorimeter (WBS 1.4) – Y. Kubota.

1.4.1 - Detector - PWO Crystals

GIF (Gamma Irradiation Facility) at IHEP suspended testing of crystals to get ready for the test beam studies of the same crystals so that we can compare the irradiation studies done with ^{137}Cs source and high-energy beams.

1.4.3 - EMCAL Electronics and Associated Infrastructure

QIE prototype chip submission using CMP 4” multi-project wafers was submitted. Expect chips by the end of the year.

Also, a personality card, which is needed to use the universal ASIC test system at FNAL to test QIE after chip-level tests by the design engineer is finished, is being designed (50% complete), and firmware is being written (started).

Resources

No issues.

Milestones in the next 6 months

Milestones which OP says we should have met in the recent past are.

1.4.3.1.2.1.12 Testbeam ADC cards (FEB)
It is being worked on and expected to be done by February 2005.

1.4.3.2.5.1.2 (First QIE test chip is functional)
On schedule for completion by 28Mar05. MPW run was submitted and the vendor is working on it. Expect chips to arrive by the end of the year. Design engineer's testing will be a few months. In the middle of this testing, physicists' testing will start and expected to last until August.

1.4.3.2.5.2.5 (Interface & probe cards are assembled)
Cecil Needles has been working on this and well on his way to be on schedule.

Muon Detector (WBS 1.5) – P. Sheldon

Overview

The main activity for the month centered on getting ready for the next round of beam tests (in November) and on design work for the muon quads and muon system installation. Work continued on test stand development and on our WBS and schedule.

WBS Level 3 Narratives

1.5.1 - Muon Planks

No planned activity in the Muon WBS.

We ordered a new shipment of stainless steel tubes from a second vendor for evaluation and for use in making new planks for the November beam test run.

We ordered more parts (gas manifolds, fred ribs) from the Vanderbilt machine shop for use in making new planks for the November beam test run. The shop intends to make these parts using the "palletized" fabrication method they will use for production, the idea is to begin to debug this process.

1.5.2 - Muon Quads

No planned activity in the Muon WBS.

The University of Illinois assembled a full scale prototype of one muon wheel. A wheel was installed using the method we intend to use to install the muon detector in the beamline at C0, including the installation hardware and the hardware that we will use to hold the detector in place once installed. The Illinois group (two technicians, one engineer, one physicist) installed the wheel the first time in roughly half a day. They are now working on tweaking the design of the muon quads and the installation method to make improvements based on this experience.

1.5.3 - Muon Electronics

No planned activity in the Muon WBS.

1.5.4 - Muon Test Stands

No planned activity in the Muon WBS.

Work continued on tension and HV plank test stands. We have designed a new control board for the tension measurement stand which also includes inputs and control for the HV test. During September a Vanderbilt undergraduate (Lenka Tomankova) began assembly of this control board.

1.5.5 - Muon Gas System

No planned activity in the Muon WBS.

1.5.6 - Muon Software

No planned activity in the Muon WBS.

1.5.8 - Muon Subproject Management

No planned activity in the Muon WBS.

Milestones for the next six months: None.

Physicist, engineering, drafting, technician, installation team, and survey resources are currently at their planned levels. In particular, sufficient physicist, engineer, technician, postdoc, graduate student, and undergraduate student labor exists at all three university sites. We will need to start to ramp up our labor in April of 2005. At that time we will need to add one full time technician at Vanderbilt. Undergraduate labor and further part-time technician labor will need to be added this summer at all sites.

Forward Straw Tracker (WBS 1.6) – A. Hahn.

Overview

September was characterized by our tying up as many loose threads as possible before the end of FY2004. Level 3 managers have been assuming the roles for effort and monthly reporting that the project will require.

Level 3 Narratives

1.6.1 –Straw Chambers- Level 3 Manager: John Krider

1.6.1.3.3.1 (FNAL) -Half-view frames
Work continued on the layout of U, V views for Stations 1&2. We are developing hinge connections of strut to frame to minimize twisting of the strut. Calculations have been run on the sag of bundled modules v. material type, material thickness, axial tension

1.6.1.3.5 (FNAL) - Prototype detector
Detail mechanical drawings for Module zero support have been made for the Station 3 prototype and fabricated parts. Drawing sets for 8mm straw modules (assembly, endplates, endplugs) have been generated. We are getting samples of conductive elastomers.

1.6.1.4.1.1 (FNAL) Straw Specifications
We have completed the assembly of test stand for controlled straw leak evaluation

1.6.1.5.4.1 (UH) prototype Single straw leak detector
We have built and tested the differential pressure system of the leak detector using copper tubes and a high-sensitivity differential pressure gauge (30 inches of water full range with 3 digit display). The differential pressure gauge showed some large differential pressure between the two copper tubes in the first hour after the copper tubes were isolated by a diaphragm valve. The long-term (100 hours) result showed a leak rate of less than 1% per day.

1.6.1.5.5.1 (FNAL)- Module Leak Detector
We have tested a prototype module leak tester by measuring leak rate of 6 straws and 4 um orifice

1.6.1.5.15 (FNAL) Twister QC tooling
We have started the tooling design.

1.6.1.8.1 (Frascati) – M0X
We worked on the assembling a prototype of straw for module mx0. A small prototype was sent for tomography in Bologna University.

Straw Detector Electronics- Level 3 Manager: Walter Stuermer

1.6.2.2.2 (UVa) Preamp/Discriminator Board
Harry Powell, from the University of Virginia has performed tests on the performance of the first prototype ASDQ card and so far the results look ok. He has begun to look at changes in the card for the second prototype for the purpose of conforming to the recommended mechanical model.

1.6.2.3.2.2 (FNAL) Communications Interface Test
W. Stuermer has written a document describing the mechanism for assigning routable BCO numbers to event records coming from the front end modules to the DCB.

1.6.2.3.2.4 (FNAL) TDC ASIC R&D

Ahmed Boubekeur has developed a schematic level design for the digital locked loop and tdc counter parts of the TDC ASIC.

1.6.3- Mechanical, Gas, Calibration – Level 3 Manager Dan Olis

1.6.3.1.1 (UVa) Chamber Aging R&D
We have begun EM radiation study of the copper anode 4 mm straw and optical evaluation of undamaged/damaged straws. We continue preparation of NSF version of hadronic radiation proposal at the Indiana Cyclotron,

1.6.4 – Integration and Testing – Level 3 Manager: Penny Kasper

1.6.4.1.1 Meson test beam
We have remounted downstream Fenker chamber and scintillator to make space for M0X test beam run. A repaired Fenker Chamber has been reinstalled. The chamber gas systems continue to be maintained.(FNAL).
Test beam analysis trying to understand the source of less than optimal resolution (UVa)

1.6.4.1.6 – Physicist Support (Simulations) of Straw Detector
We are developing the straw configuration in GEANT 4. (UVa)

Administrative/ Project Management

1.6.5- Forward Tracker Straw Detector Subproject Management

1.6.5.1-(FNAL) Management
The main activities have been:

- Review and edit WBS effort and costing.
- Participate in Temple review.
- Participate in Straw Meetings

There is one milestone 1.6.1.3.5.2.2 (level 5) at the end of November 2004, which involves leak testing of straws for the prototype. A predecessor of this activity is described above- (1.6.1.5.4.1- Prototype Single Straw Leak Detector. It is unlikely that all prototype straws will be done by this milestone date, partly due to the slow startup of these activities. I note that this milestone did not appear in the August Monthly report due to the activity appearing (incorrectly at that time) as a pre-conceptual R&D activity.

There are two other milestones (L5) which come due in April 2005 which concern the requirement documents for the databases for both the Detector Construction Database (1.6.4.3.3.1.8) and Detector Configuration Database (1.6.4.3.3.2.8). The first is likely to be easily made since the choice can be made within the confines of the Straw group, while the latter will require attention from the Project Office and the I&I subproject due to need to coordinate the choice with the remainder of the detectors.

It is still a challenge to launch the subproject as we are still quite heavily engaged in the CD 2/3a review period.

Forward Silicon Microstrips (WBS 1.7) – L. Moroni

Overview

The activity in this phase of the project is concentrated on the construction of the final prototype of a micro-strip ladder, which will be tested around the end of 2005 to validate all the techniques and, thus, to proceed to the next Pre-Production phase. Major activities will be on Pass Two read-out chip, hybrids & flex-cables and inner station mechanics, as it can be deduced from the next six month milestones.

WBS Level 3 Narratives

1.7.1 - Sensors

No WBS activity for sensors was scheduled to occur in September.

1.7.2 - Electronics

1.7.2.1 - IC Readout Chips
No activity was scheduled for September 04 on the read-out chip development. Nevertheless, because of the availability of personnel in Pavia, we decided to anticipate the simulation work for Pass Two IC, which was originally scheduled for October 04. This should allow us to reduce the time needed to reach the first milestone, i.e. 2.1.3.1.1.8 (T5M: Pass Two IC Schematics, Simulations, Layout).

1.7.2.2 & 1.7.2.3 – Hybrids and Flex cables
In August, at SiDet, we started the assembly of a pre-prototype ladder to test the preliminary versions of the hybrids and flex cables, which have been delivered in September. We are now in the process to assemble the IC's on the hybrids.

1.7.3 – Mechanics and Cooling

We have practically defined with PLYFORM all the Reqs and Specs for the inner station mechanic prototype. During this month we have studied & simulated different solutions for the cooling duct that will be embedded in this structure. It appears that the best solution would employ a rectangular section PEEK tube with very thin wall. We are pretty close to reach the first foreseen milestone for this subproject, i.e. 3.1.1.3 (T5M: STMEC Reqmts & Prel Specs Documents Revwd & App).

1.7.4 – Integration

No integration activities were scheduled this month.

Administrative / Project Management

We are on schedule on all the subprojects.
The Milestones for the next six months are listed in the following table.

Activity ID	Activity Description	Early Start
2.1.3.1.1.8	T5M: Pass Two IC Schematics, Simulations, Layout	12Jan05
2.1.3.1.2.4	T5M: Pass Two IC Proto RFPs Revwd & Apprvd; V	04Feb05
2.2.2.4	T5M: Updated Hybrid Specs Doc Revwd & App	25Oct04
2.2.2.6.1.5	T4M: Hybrid Vend Sel Revwd & Apprvd	28Mar05
2.2.2.6.2.4	T5M: Hybrid Assembly&Test Proc & RFP Proc Appr	02Mar05
2.3.1.2.4	T5M: Updated Flex Specs Doc Revwd & App	28Oct04
2.3.1.2.11	T4M: Flex Vend Sel Revwd & Apprvd	04Feb05
2.3.2.1.3	T5M: Bias Flex Reqmts Document Revwd & App	14Oct04
2.3.2.1.6	T5M: Bias Flex Prel Specs Documents Revwd	26Oct04
2.3.2.1.11	T5M: Bias Flex Perfance Revwd & App	21Dec04
2.3.2.2.4	T5M: Bias Flex Final Specs Document Revwd & App	13Jan05
2.3.2.2.9	T5M: Pre-Prod Bias Flex Revwd & Apprvd	09Mar05
3.1.1.3	T5M: STMEC Reqmts & Prel Specs Documents Revwd & App	03Dec04
3.1.1.4.4	T5M: Pass One STMEC Proto Des & RFP Revwd & Apprvd	25Mar05
4.3.2.1.5	T5M: MSRC Test Stand Des & Test Results Apprvd	23Dec04

Trigger (WBS 1.8) – E. Gottschalk

Overview

We have implemented the new pixel geometry using Geant3, and have started to look at the changes that need to be made to the L1 trigger code to accommodate the changes to the geometry. The question that needs to be answered is whether or not we need to redesign the pattern recognition hardware in the L1 trigger to accommodate the changes in the geometry.

We have also started to investigate real-time operating systems (RTOS) for the L1 trigger processors. Our studies of operating systems produced by different vendors include cost, licensing issues, performance considerations, and target hardware.

We have also done the research to decide on what needs to be purchased for the Prepilot L1 Farm in October.

We have been working with the Fermilab Computing Division to find a location for the L2/3 prototype farm.

WBS Level 3 Narratives

1.8.1 – L1 Hardware and Software

1.8.1.1 Pixel Trigger System

For the L1 pixel trigger we had discussions and did studies of the new simulation models for the L1 pixel trigger, and how the geometry affects the pixel trigger hardware. The initial results suggest that our current architecture for the L1 hardware will be able to accommodate the new

geometry. Some of the L1 trigger parameters need to be modified to implement larger search windows, and we may need to make some changes to the FPGA hardware to accommodate the changes. Additional work will be required to study parameter settings, details of the FPGA implementation, and studies of trigger performance for the new geometry.

We are beginning to plan the work for the Pilot trigger system. This work will begin in January of 2005.

1.8.2 – L2/L3 Hardware and Software

1.8.2.3 L2/L3 Hardware

For L2/3 hardware, the serial cables and DB9-RJ45 adapters were completed. Some of the adapters were made so that we can test serial cables using two PCs without the (one) serial console server. The installation of the serial console server and associated cables and adapters in the L2/3 prototype farm is awaiting the move of the L2/3 prototype to FCC2. We have been working with the Computing Division to relocate our farm to FCC2, which will be next to the new 84 worker nodes we have obtained from the Computing Division. These are retired farm nodes. We have also continued to develop the software that is needed to use the serial console server more easily, and to develop the farm monitoring software.

Administrative / Project Management

We worked on preparations for the CD2/3a review.

Personnel

After some discussions with our liaison to the Computing Division, we will be adding a second software engineer to the L1 pixel trigger effort. The software engineer will investigate real-time operating systems (RTOS) for the L1 trigger farm.

Milestones

In January of 2005 we will begin working on specifications for the L1 pixel trigger and L1 muon trigger. The work that we are doing for the remainder of 2004 will be used as a basis for the specifications.

Event Readout and Control (WBS 1.9) – K. Honscheid, M. Votava

Overview

Almost all ongoing work is in project management in preparation for upcoming reviews with a .5FTE Computing Division effort. DCB engineer starting coming up to speed with respect to detector subprojects especially in relationship to the front end board interface. Software design begins in January, and we are actively trying to fill an open position to help in this activity.

Milestones

The only milestone in the next six months is 1.9.2.1.1.4 System Overview Document Approved, scheduled for March 29th ,2005.

Integration &Installation (WBS 1.10) – J. Howell

Overview

Joe Howell continues as interim level 2 manager as project management interviews candidates to fill the position of Project Integration Physicist.

The majority of the effort this month was devoted to final preparations for the Director's CD-2/3a which took place September 28-30. In general, the review went well and the subproject received valuable advice on areas where project documentation needed updating and strengthening.

1.10.1 - Installation, Integration, Testing and Commission Planning

The only activity scheduled for the following six months is the development of a preliminary set of installation drawings. The most recent C0 building outfitting drawing features from FESS have been incorporated into the overall detector/building. Significant changes include the elimination of the electronics bridge and expansion of counting room space

1.10.2 - Infrastructure Development + Procurement, Install+Test at C0

No activity has occurred in the past month. Activity to establish Requirements for Alignment Monitoring System have been delayed until the 2nd half of FY2005 to allow the funds to be applied to higher priority project activities. This change will have no impact on the overall project schedule.

1.10.3 - Component and Syst Transport, Assembly, Install, and Connect

No activity has occurred in the past month. The first activity is scheduled to begin in 2006

1.10.4 - Multiple Subsys Interconnect and Int +Testing at C0

No activity has occurred in the past month. The first activity is scheduled to begin in 2009

1.10.5 - System Integration and Testing

No activity has occurred in the past month. The first activity is scheduled to begin in 2009

1.10.6 - System Install Integrate Commission Subproject Management

Work on revising the Open Plan cost and schedule file was completed. Work on updating project documentation including the contingency analysis document, installation plan document and TDR have begun.

Administrative / Project Management

There are no milestones within the next six months.

Joe Howell (PPD Engineering) continues at a 60% FTE level with effort charged to the Project Office cost account which covers the cost of the project ME.
John Rauch (PPD Design/Drafting) worked at a 20% FTE level

C0 Interaction Region (WBS 2) – M. Church

Overview
In preparation for the CD-2/3a reviews the cost/schedule was finalized by the C0 IR team and sent to BTeV management for top-down adjustments. The C0 IR team participated in the Director's CD-2/3a review. Design work continued on magnetic components, cryogenic components, and LCW components.

WBS Level 3 Narratives

2.1 – Magnets

2.1.1.1.1: Component design: Pre-Conceptual R&D *(quad cold mass)*
Magnetic and Thermal analysis has been completed. The expansion loop layout is close to completion. Preliminary yoke layout is completed and is ready to be detailed.

2.1.1.2.1.1: Cryostat design: Pre-Conceptual R&D
The layout of C0 IR region is close to completion. The vacuum vessel and suspension design have begun.

2.1.1.3.1.1: MTF test stand design: Pre-Conceptual R&D
The conceptual design of the test stand has been completed. The design and detailing of the Feed Box is in progress.

2.1.2.1.2: HTS leads: Pre Conceptual
A "Special Purpose Spare" lead was tested to confirm that the leads can carry currents up to 10 kA. A second pair of leads is being prepared for cold testing.

2.1.2.2.1: Corrector magnets: Pre-Conceptual R&D
After discussions with several labs, we have decided (in consultation with BTeV Management) to go with BNL for Corrector Magnets. Currently drafting an MoA between Fermilab and BNL.

2.1.2.3.1.1: Spool design: Pre-Conceptual R&D
As the designs for corrector magnets and HTS leads are becoming available, the conceptual design of spool assembly is being finalized.

2.2 - 2005 Shutdown

2.2.1 - Preliminary LCW design: FY05/06 R&D

Preliminary design work continues at a satisfactory pace.

2.4 - Cryogenic Elements

2.4.1 - Design Preparation: FY05/06 R&D *(non-magnetic cryogenic elements)*
Design preparation continues at a satisfactory pace.

Administrative / Project Management

There are no milestones scheduled for the next 6 months. The next milestone is 01Apr05.

In preparation for the Director's CD-2/3a review, the C0 IR team completed the Open Plan WBS cost/schedule and supporting documentation. The TDR was updated. The complete suite of management documentation was updated. A Memorandum of Agreement (MoA) was drafted (and continues to be finalized) between FNAL and BNL for the fabrication of corrector magnets. Drafting of specifications and RFQ's for long lead items was initiated.

C0 Outfitting (WBS 3) – T. Lackowski

Overview

Work continues towards the completion of the Title 1 Report. Work was accomplished by level 2 and level 3 managers to update various management documents and Open Plan. Discussions continued with Fermilab Procurement department for the C0 Outfitting Phase 1 RFP preparations. The C0 Outfitting Phase 1 Advanced Conceptual Design was substantially completed by the end of September. Participated in the CD2/3a director's review.

Administrative / Project Management

We are anticipating the final design of contract documents for C0 Outfitting Phase l to start mid December 2004. Project team has been identified. Resources are available for this effort.

Project Management (WBS 4) – M. Lindgren.

Overview

The Project Office activities were dominated by preparations for the Director's CD-2/3a review of the project, which was held on September 28-30. The Spokespersons, Project Directors, Project Manager, PBO and PSO spent two weeks conducting "drill-down" exercises in all the L2 subproject Open Plan files. The project had intended to "freeze" the Open Plan subproject files by September 10th so that the PSO could work on the master Open Plan file in preparation for uploading the information into Cobra, and subsequently into the laboratory Oracle financial system. These internal reviews of the subproject files found that many of them were in good shape, but that some needed additional work on scheduling and supporting documentation. The files were not all in the Project Schedule Officers hands until Sept. 15th. The PSO worked on assembling the Project master file from the subproject files from that point until shortly before the Director's review, where the master rollups were shown.

VI. ES&H HIGHLIGHTS

Management Overview

M. Heflin, the BTeV Project ES&H Coordinator provides ES&H support for the Design Phase of the BTeV Project. The primary effort is to provide ES&H support to the Sub-Project managers and task managers for all C0 installation activities. They also provide oversight of the implementation of the T&M and Fixed Price subcontractors' safety programs, which includes concurring with the subcontractor on where improvements are needed and the priority for those improvements. Additional efforts include verifying continuing improvement, hazard analysis review and participation in daily and weekly ES&H Inspections with the C0 Floor Manager and representatives from the DOE Fermi Area Office.

The BTeV Project ES&H Coordinator will chair regular meetings with members of the BTeV project management team to discuss work planning issues, ES&H/QA review updates and issues, hazard analysis issues, training issues, facility safety issues, and general ES&H program issues. We are still in need of filling this position.

ES&H support personnel and BTeV managers for the installation phase of the project will meet on a daily basis to discuss the daily schedule, upcoming tasks, related ES&H requirements, hazard analysis, ES&H training and other ES&H issues. They also review and plan for upcoming tasks in the schedule.

BTeV Safety Issues

Project Safety Performance

Safety Performance for the BTeV Project for 2004 Calendar Year to Date includes a Recordable Incident Rate of 0**,** a Lost Time Incident Rate of 0.0, and a Lost Workday Incident Rate of 0.0. The Project to Date Safety Performance includes a Recordable Incident Rate of 0, a Lost Time Incident Rate of 0, and a Lost Workday Incident Rate of 0.

VII. LEVEL 3 MILESTONES

There are no project reportable milestones during this period.

VIII. VARIANCE ANALYSIS – M. Lindgren

Variances will be reported after the beginning of the 2005 fiscal year.

IX. COST REPORTS

Cost and earned value reports for the BTeV Project are presented in two sets, one for Total Estimated Cost (TEC), and a second for Other Project Costs (OPC). Information for all segments of the project is summarized at WBS Level 3 except in the case of the OPC CURVE Reports that are at WBS Level 2 instead. The actual cost of work performed (ACWP) is comprised of the following: 1) costs collected and reported by the Fermilab financial system, 2) costs collected and reported to BTeV Project Management by the collaborating institutions. Since the Italian collaborating institutions are not required to report their actual costs to BTeV Project Management, we are assuming that actual current period costs and cumulative costs are equal to current period earned value and cumulative earned value, respectively. Each set of cost and earned value reports includes the following:

CPR Format 1A
This is a modified version of the traditional CPR Format 1 report that shows indirect cost for each WBS Level 3 rather than as a single line item for the entire project. As a result it is possible to review the status of both burdened and unburdened costs for each major system or cost component. In addition, the report for the OPC includes a summary section at the end, with WBS Level 2 totals for the BTeV Detector and Project Support segments of the project.

CPR Format 3
This is the traditional format for reporting changes to the project baseline that were approved and implemented in the current reporting period, as well as their impact on the time phased project baseline.

CURVE Reports
These graphically depict cumulative Budgeted Cost of Work Scheduled (BCWS), Budgeted Cost of Work Performed (BCWP), and Actual Cost of Work Performed (ACWP), at WBS Level 3 and WBS Level 2 for the TEC and OPC, respectively. The OPC reports reflect all project costs, and all amounts shown are fully burdened.

Plan v Act Reports
These reports compare burdened planned costs (BCWS) with burdened actual costs (ACWP) on a cumulative basis through the end of the prior fiscal year, and by month for the current fiscal year. There are two versions of this report, one for total cost, and a second for labor costs only. Both OPC versions represent US Funds only.

BTeV Project Obligations

This report reflects burdened obligations to date, including requisitions in progress, for the entire project, as recorded in the Fermilab financial system. Consequently, it does not include any assumed obligations with respect to work performed by the Italian collaborating institutions.

The BTeV project will produce these reports after the CD-2 baseline review.